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ABSTRACT

Subjects in this study were 69 fourth-grade students enrolled in a Chapter 1 program who received low scores on a standardized reading comprehension test in the spring of 1982. One group (n=35) received 15 minutes of programed reading tutoring each day throughout the 1982-1983 school year as a supplement to classroom instruction. The Houghton Mifflin Reading Series was used for classroom instruction and the Houghton Mifflin Tutorials were used for the programed tutoring. Results indicated that programed tutoring did not significantly improve reading comprehension, although the experimental group did narrow the gap that existed on the pretest scores between themselves and the control group (n=34). A loss from the pretest to the posttest was shown by 32% of the control group students, who received no tutoring, while only 9% of the experimental group showed such a loss. The control group's posttest scores also displayed a greater variablity than their pretest scores, while the variability of the experimental group's scores remained relatively unchanged. Thirty-two references are listed. (Author/LMM)

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THE EFFECT OF PROGRAMED TUTORING UPON THE READING COMPREHENSION OF FOURTH-GRADE STUDENTS ENROLLED IN A CHAPTER 1 READING PROGRAM

A Presentation to the
Association for Educational
Communications and Technology

Graduate Student Research Session

Dallas, Texas

January 21, 1984

by

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ABSTRACT

The major purpose of this study was to investigate the effects of programed tutoring upon the reading comprehension of fourth-grade students enrolled in a Chapter 1 program. Reading comprehension was measured by the Reading Comprehension Test, Iowa Tests of Basic Skills, Form 7, Level 10.

The subjects of this study were 69 fourth-grade students who scored below the 37th percentile on the Reading Comprehension Test, Iowa Tests of Basic Skills, Form 8, Level 9 in the Spring of 1982. One group (N = 35) received fifteen minutes of programed reading tutoring each day throughout the 1982-83 school year as a supplement to classroom instruction. The Houghton Mifflin Reading Series was used for classroom instruction and the Houghton Mifflin Tutorials were used for the programed tutoring.

A t-test was conducted on the two groups' pretest mean normal curve equivalents (NCE's) scores. This test was followed by an analysis of covariance using the pretest scores as the covariate. Finally, mean gain NCE's scores were analyzed using a t-test.

The results of this study indicated that programed tutoring did not significantly improve the reading comprehension of fourth-grade students enrolled in a Chapter 1 program when mean NCE's and mean gain NCE's scores were analyzed. A review of the descriptive statistics

presented evidence that the experimental group did narrow the initial gap between themselves and the control group. Thirty-two percent of the students in the control group showed a loss from the pretest to the posttest while only nine percent of the experimental group did so. The control group's posttest scores displayed a greater varibility than the group's pretest scores while the experimental group's scores varibility remained relatively unchanged.

THE EFFECT OF PROGRAMED TUTORING UPON THE READING COMPREHENSION OF FOURTH-GRADE STUDENTS ENROLLED IN A CHAPTER 1 READING PROGRAM

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Background

Over 34 million dollars were allocated to school corporations (districts) in Indiana to conduct Chapter 1 programs in 1981-82. Nationwide, over 2.6 billion dollars were distributed to the 50 states based on a formula that takes into account the number of children living in poverty in each county of the state and the statewide per pupil expenditures. The distribution formula is specified in Chapter 1 of the Educational Improvement and Consolidation Act (1981) which replaced Title 1 of the Elementary and Secondary Education Act of 1965 and its later amendments.

Indiana school corporations that qualify for Chapter 1 funds, as determined by Chapter 1 criteria, may expend these monies for remedial reading, mathematics, or language arts programs. Over 95,000 students received a Chapter 1 reading service compared to 26,000 in math, and 2800 in language arts during 1981-82.

Programed tutoring was used by only 25 of the 189 school corporations of which the Tippecanoe School Corporation (Lafayette, Indiana) was one. Since 1976 when programed tutoring was implemented in the Tippecanoe School Corporation, TSC Chapter 1 student gains have been higher than the state wide gains as measured by normal curve equivalents (NCE's).

The superior gains made by the TSC Chapter 1 students who have been taught using programed tutoring would indicate that programed tutoring is a viable method for providing remedial reading instruction for educationally deprived students.

In these days of ever-increasing Federal dollar support for special programs, it would seem appropriate to achieve the greatest gains possible with the dollars that are available. Indications from the TSC results are that programed tutoring has the potential to be an instructionally effective and cost efficient method for use in Chapter 1 programs.

Problem Statement

The purpose of this study was an attempt to answer the following question:

Do fourth-grade students in a Chapter 1 reading program taught by programed tutoring have a significantly higher increase in reading comprehension scores than those not receiving programed tutoring as measured by the Reading Comprehension Test (R), Iowa Tests of Basic Skills, Form 7, Level 10?

Basic Assumptions

The following assumptions were basic to the investigation:

1. Reading is the most important skill a child learns in school because it is vital for success in all school subjects and for the child to become a literate, productive member of society.
2. Educationally deprived children should receive instruction in deficient basic skills in addition to the instruction received in the classroom--a basic premise of ECIA Chapter 1.

3. Educationally deprived students should receive remedial reading instruction that provides the potential for maximum gains in reading comprehension.

Limitations

First, second, and third graders are served first by the Tippecanoe School Corporation's (TSC) Chapter 1 program because these students are deemed to be the ones who benefit the most from the program, based on the gains reported by past achievement test scores. Since all eligible students in the first three grades were served by the program, there were no students available from these grades to serve as a control group. Inclusion of students from the first three grades in this study would have strengthened this investigation.

Sample

This study involved 69 fourth-grade students from six elementary schools in a rural or suburban setting of the Tippecanoe School Corporation, Lafayette, Indiana. All students included in this study scored below the 37th percentile on the Iowa Tests of Basic Skills (ITBS) Reading Comprehension Test (R), Form 8, Level 9 in May, 1982. Students in the experimental group were assigned on the basis of tutoring time being available when the student was not in a special class such as art, music, or physical education. Students' scores on the Iowa Tests of Basic Skills (Spring, 1982) were not a basis for assignment to the experimental group.

The experimental group (N = 35) received fifteen minutes of programed reading tutoring each school day throughout the 1982-83 school year as a

supplement to classroom instruction. The control group (N = 34) received no supplemental instruction. Both groups received classroom instruction based on the Houghton Mifflin Reading Series.

Stimulus Materials

The Houghton Mifflin Tutorials designed to be used as a supplement to classroom teaching based on the Houghton Mifflin Reading Series was used with the experimental group. The programed tutorial teaching materials include the Comprehension and Word-Attack (CAWA) Skills Books, The Tutor's Guide Handbook and the Tutor's Guide Item Programs Booklet.

The CAWA Skills Books are nonconsumable texts that contain programed lessons relating to oral reading, comprehension, and word-attack activities. The lessons are designed to teach the skills using the same story characters and vocabulary that appear in the Houghton Mifflin Reading Series texts. The lessons in the CAWA Skills Books provides the pupil with experience in the same skills and in the same sequence as those provided in the classroom.

Procedure Description

The tutoring process was carried out by 36 adult women who were trained to tutor during 15 to 20 hours of formal instruction. Tutor training workshops were first held in the Tippecanoe School Corporation in October, 1978, when the Houghton Mifflin Reading Series was adopted. Approximately sixty percent of the tutors have worked in the Chapter 1 tutoring program since its inception in 1978. Two certified elementary teachers are employed by Chapter 1 to directly supervise the reading tutors.

Tutoring was done on a one-to-one basis between the tutor and student for fifteen minutes each school day throughout the 1982-83 school year. The teaching activities of the tutor were tightly prescribed by:

1. detailed instructions that must be followed explicitly,
2. teaching materials included in the Comprehension and Word-Attack (CAWA) Skills Books, and
3. the pattern of the pupil's successes and failures on each lesson.

A master list specifies the order in which the different kinds of lessons are taught by the tutor. The Tutor's Guide Item Programs Booklet gives step-by-step instructions on how to teach each kind of item. There are a total of 11 Item Programs, one of which the tutor is directed to use by a notation on the bottom of a lesson page in the CAWA Skills Books.

The procedures the tutors followed were highly individualized so that the student progressed at the maximum rate of which she or he was capable. The pupil was not required to complete any particular number of lessons in one tutoring session. The tutor praised the pupil for every reading task completed successfully by saying "good," "great," "excellent," "super," or whatever words a tutor was comfortable using. If mistakes were made, the tutor said "Let's try that again." The student was given the opportunity to discover the correct pronunciation, response, or answer through a series of specified prompts the tutor gave. Notation was made by the tutor of how many tries or "runs" were necessary for the student to achieve complete mastery.

Instrument Used in This Study

The instrument used in this study was a paper-and-pencil test. The

Reading Comprehension Test (R) of the Iowa Tests of Basic Skills (ITBS) Multilevel Battery, Form 7, Level 10 was the specific instrument employed. The Iowa Tests of Basic Skills Multilevel Battery was designed to provide comprehensive and continuous measurement of growth in the fundamental skills of reading, mathematics, vocabulary, language, and work-study (Hieronymus, Lindquist, and Hoover, 1979a). The Multilevel Battery encompasses Levels 9-14 and was designed for use at Grades 3-9.

There are three major categories of skills objectives for Test R; namely, facts, inferences, and generalizations. There is a total of 16 skills objectives that are tested in these major categories.

Collection, Scoring, and Reporting of Data

The Iowa Tests of Basic Skills were administered to fourth-grade students in the Tippecanoe School Corporation within two weeks of the Spring, 1983, empirical norm dates as specified by the test publisher. The tests were administered by the school principal in each individual school building. Scoring of the tests and reporting of the normal curve equivalents scores (NCE's) was done by the Riverside Publishing Company.

The previous Spring (May, 1982) the ITBS Form 8, Level 9 was administered to these same fourth-graders when they were completing the third grade. The NCE's reading comprehension scores from this test were used as a pretest to determine if the experimental and control groups differed in reading comprehension at the onset of the experiment.

The Tippecanoe School Corporation (as do all other Indiana school corporations) reports Chapter 1 gains in normal curve equivalents scores to the Division of Compensatory Education, Indiana Department of Public Instruction on July 1st each year.

The normal curve equivalents (NCE's) score reported by the testing service converts percentiles into a normalized equal interval scale suitable for computing and comparing gains in achievement. The NCE's score has the combined advantage of percentiles and stanines since it can be used for comparing the performance of a group with that of a norm group. It can also be meaningfully averaged.

Research Design

The Stanley and Campbell (1966) Nonequivalent Control Group Design (#10) was selected for this study because students could not be assigned randomly to the experimental and control groups. The Iowa Tests of Basic Skills, Test R, Form 8, Level 9 was used as a pretest to measure the equivalency of both groups in reading comprehension.

The dependent variable was the mean normal curve equivalents (NCE's) test scores. The independent variable was the method of instruction. The experimental group received programed reading tutoring in addition to classroom instruction. The control group received classroom instruction only. Subjects in both groups scored below the 37th percentile on the pretest.

Analysis of Data

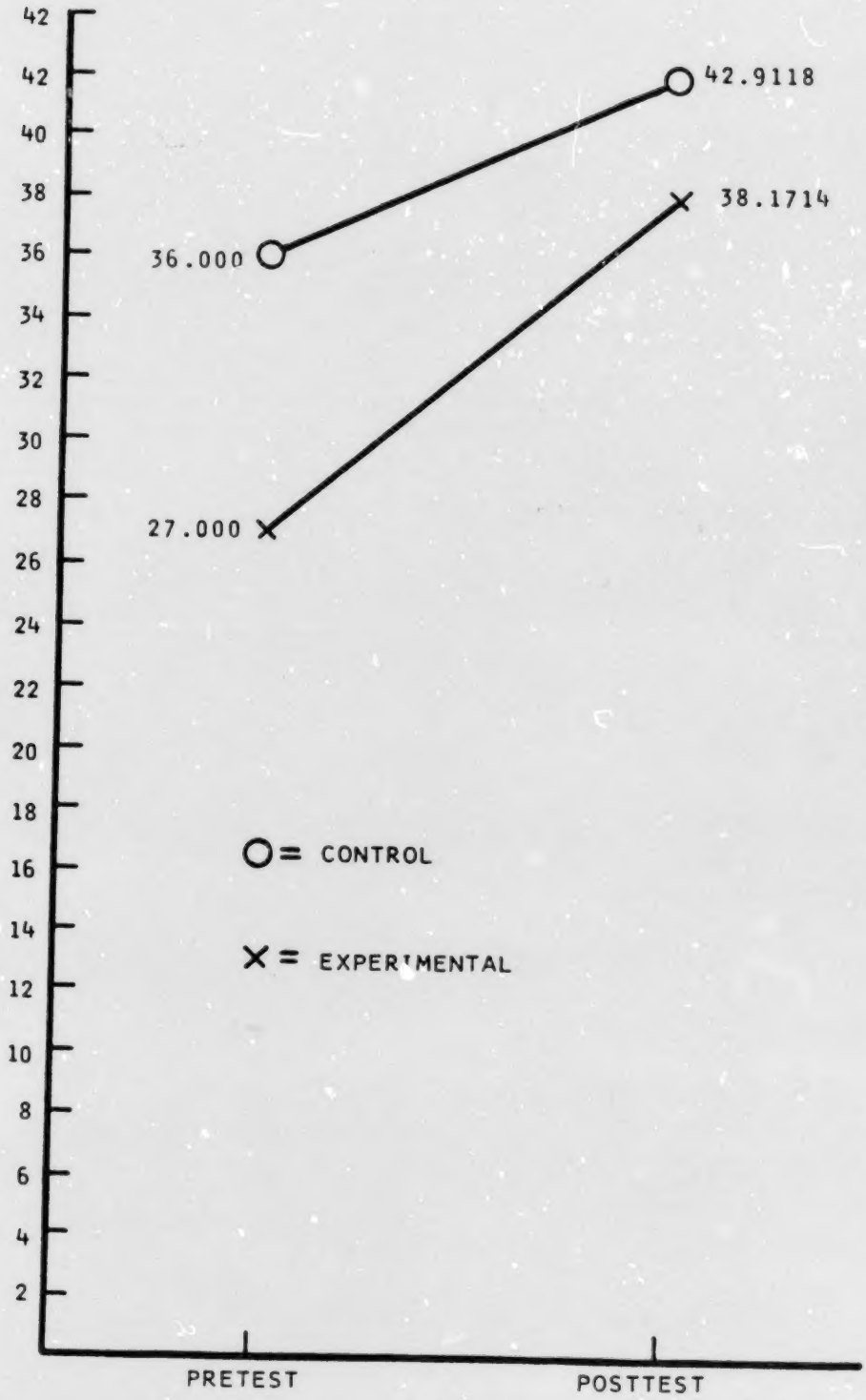
The purpose of this study was to investigate the effect of programed tutoring upon the reading comprehension of fourth-grade students who at the end of the third grade scored below the 37th percentile on the Reading Comprehension Test of the Iowa Tests of Basic Skills, Form 8, Level 9.

The experimental group received fifteen minutes of programed tutoring each day during the 1982-83 school year while the control group received no tutoring.

Reading comprehension of both groups was measured by the Reading Comprehension Test of the Iowa Tests of Basic Skills, Form 9, Level 10. Students' scores were reported in normal curve equivalents (NCE's). Normal curve equivalents scores are normalized standard scores with a mean of 50 and a standard deviation of 21.06. The reading comprehension NCE's scores served as the dependent variable.

A comparison of mean NCE's scores for the groups on the pretest and posttest is presented in Figure 1. The mean scores of the two groups were closer on the posttest than they were on the pretest. A general observation could be made that, on the posttest, the experimental group narrowed the gap that existed on the pretest between themselves and the control group. Median scores provided added weight to this observation since the median score of the experimental group on the pretest was 31 as compared to a median score of 37 for the control group. On the posttest the experimental group median score was 40 and the control group's was only slightly higher at 40.214.

The frequency distributions display the range of scores as well as the symmetry of the distribution of pretest and posttest scores for each group (see Figures 2 and 3). The range of scores for the experimental group was 37 on the pretest and 57 on the posttest compared to the control group's pretest range of 17 and posttest range of 49. The change in range of the control group's scores indicates a greater varibility which is borne out by a standard deviation of 5.087 on the pretest and 12.711 on the posttest.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42.9118
38.1714
36.000
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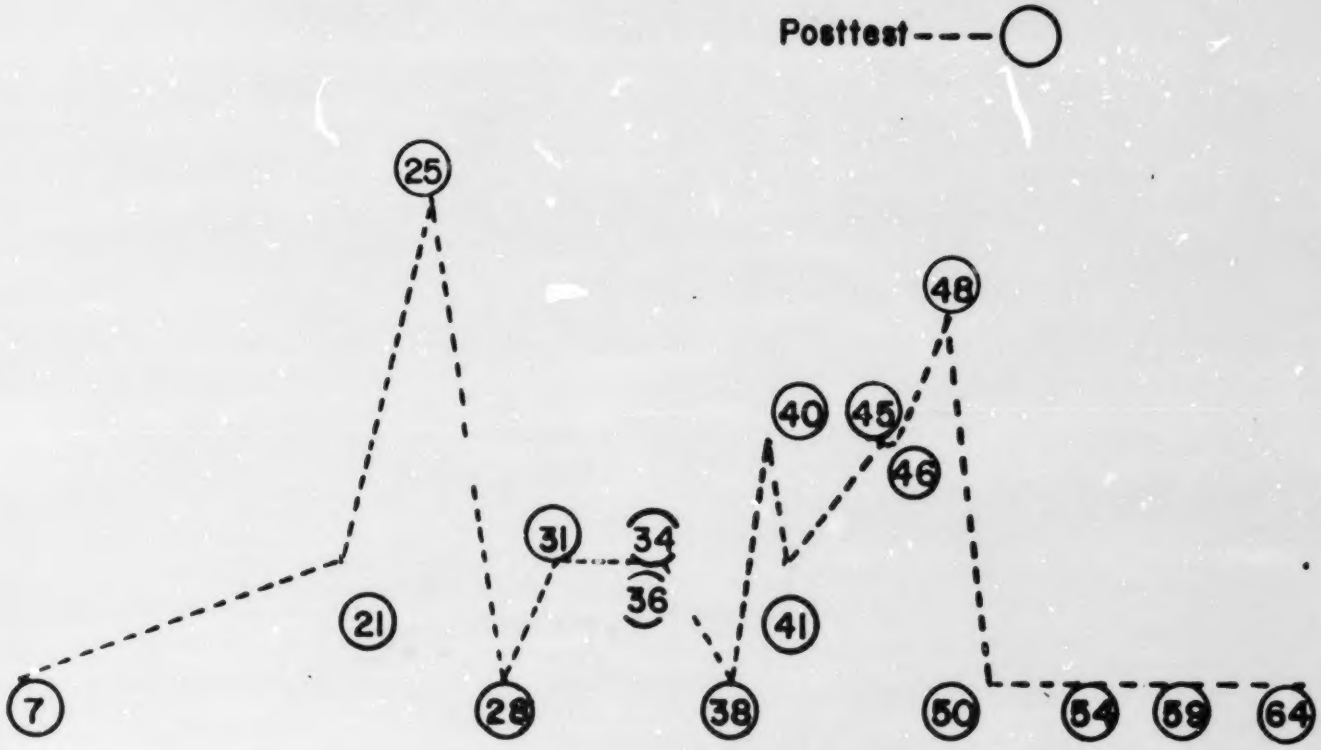
O = CONTROL
X = EXPERIMENTAL
PRETEST
POSTTEST

Figure 1

Figure 2

Frequency Distribution of Experimental Group's
NCE's Scores on the Pretest and Posttest


Posttest
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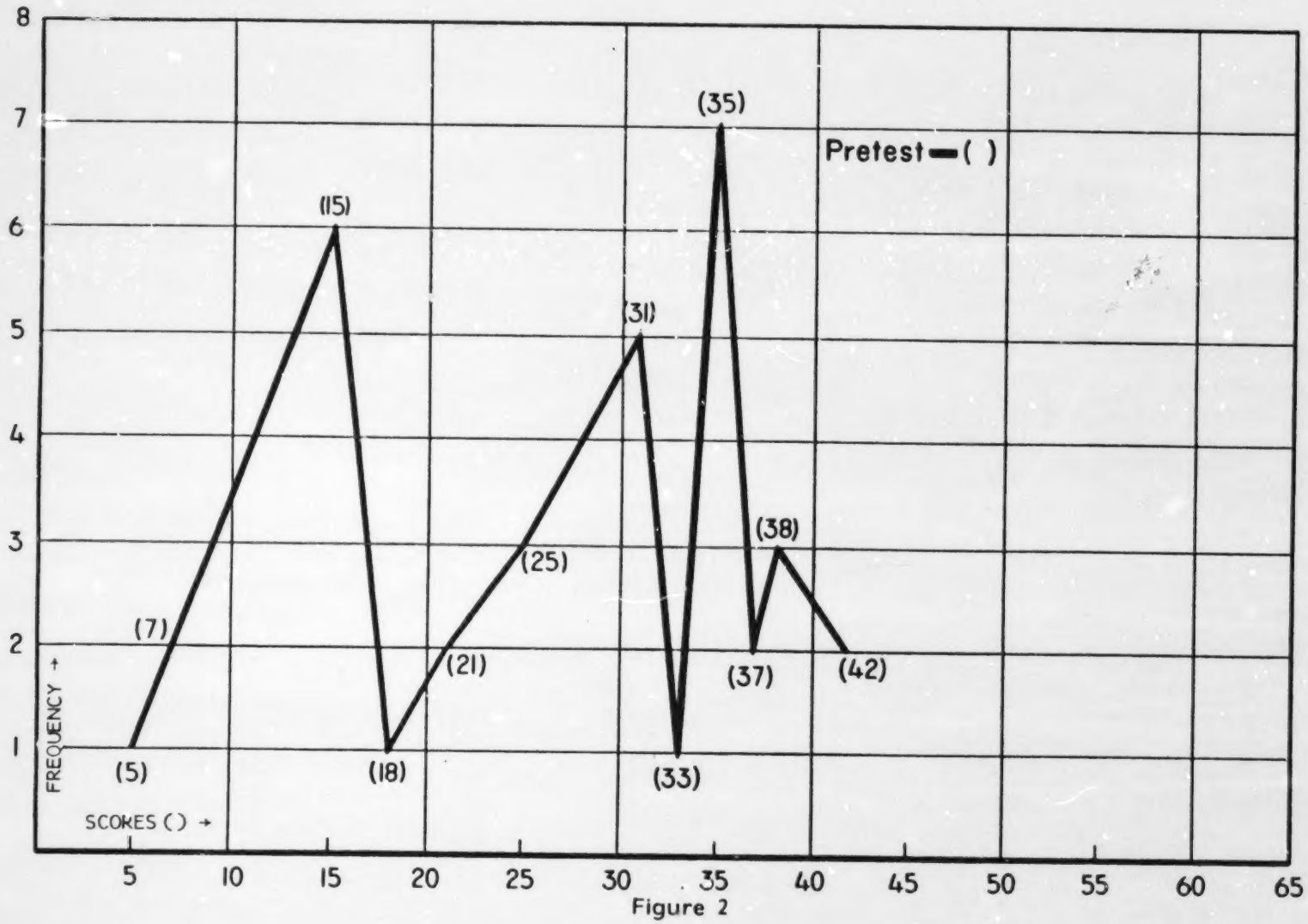
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FREQUENCY →
SCORES ( ) →
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55
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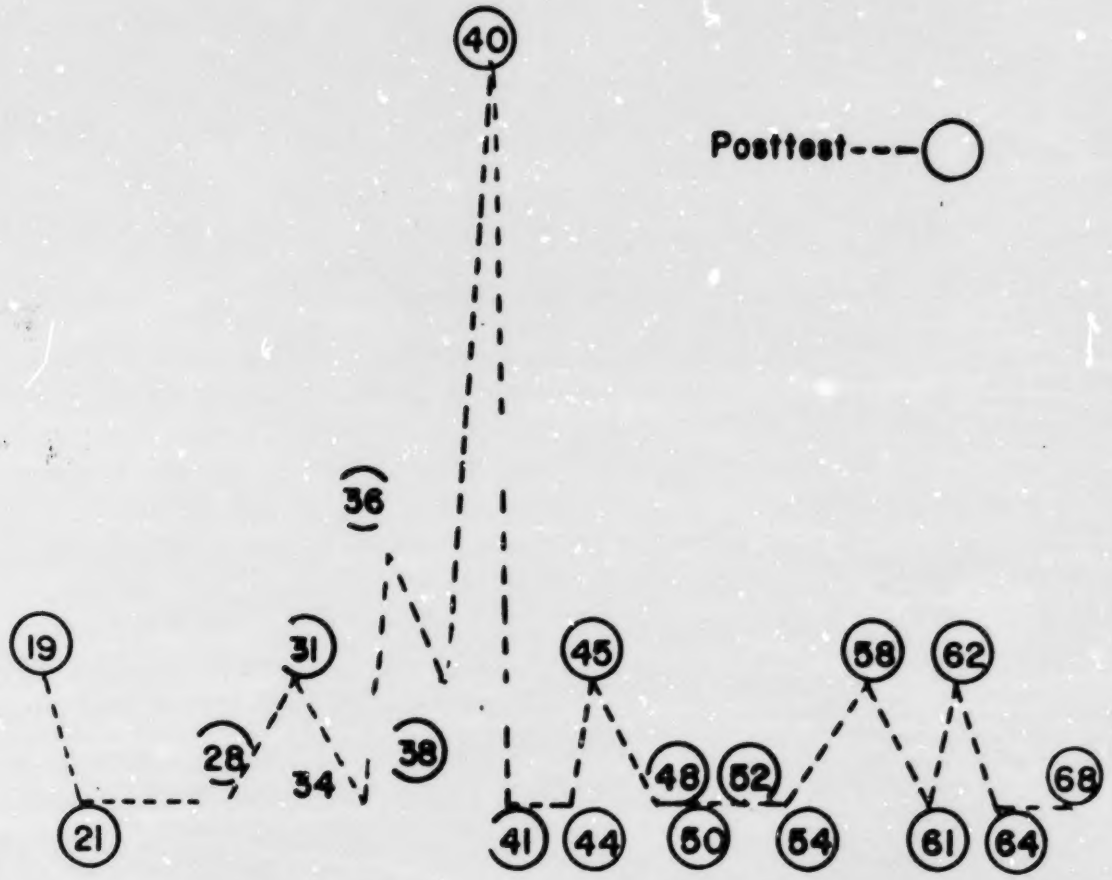
65

Figure 2

Figure 3

Frequency Distribution of Control Group's
NCE's Scores on the Pretest and Posttest



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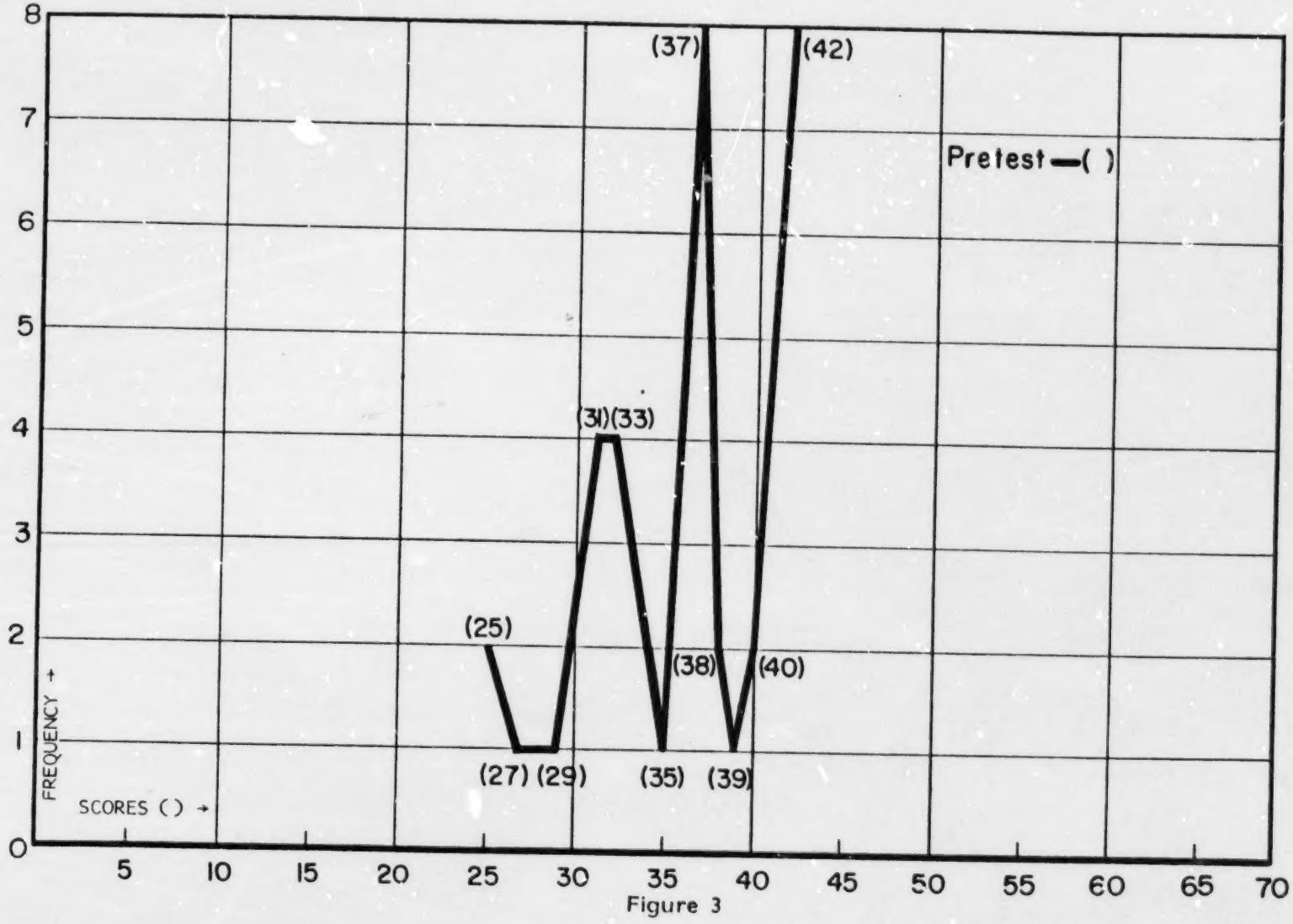
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Pretest —( )
(31)(33)
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(40)
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(39)

Figure 3

Both groups' scores on the pretest were negatively skewed. On the posttest, the control group's scores exhibited nonsymmetry and a flatter curve than did the experimental group's scores.

The pretest data were analyzed using Students t-test to determine the equivalence of the groups, since subjects were not randomly assigned to treatment groups. The t-test between the mean NCE's score of 27.114 for the experimental group and 36.000 for the control group resulted in a t of -4.43 which is significant at the .001 level with 48.94 degrees of freedom. This analysis indicated that the groups were not equivalent at the beginning of the study. This initial difference reflected a lower mean NCE's score for the experimental group.

The posttest scores were analyzed using an analysis of covariance. There was no significant difference between the experimental group and the control group on the posttest when the pretest was used as a covariate in the analysis. Therefore, the two groups which differed at the beginning of the study did not differ at the conclusion of the study when the initial difference was taken into account.

Although Cronbach and Furby (1970) have cautioned against using gain scores for a measurement of change, the authors did note that gains or differences are worth estimating to provide an indicator of less-than-normal development so that individuals may be given a special treatment. Cronbach and Furby state that "it is possible of course, given before and after scores on the same instrument, to estimate true gains of individuals and to identify those who did and did not gain" (p. 79).

In view of the fact that all subjects in this study scored below the 37th percentile on the pretest, it could be inferred that the reading

comprehension development of these students had not kept pace with their peers. Because of this fact and the additional fact that scores reported by Chapter 1 programs across the country are for mean gain NCE's scores, an analysis of gain scores was performed.

The frequency distribution of subjects' gain scores (pretest score subtracted from posttest scores) is shown in Figure 4. Appendices A and B provide the NCE's scores used for the computations of differences. The frequency distribution in Figure 4 indicated that the control group had eleven subjects whose test scores were lower on the posttest than on the pretest. By contrast, the scores of only three subjects in the experimental group showed a decline. The range of gain scores for the experimental group was 48 while for the control group it was 54.

A t-test on the mean gains of the two groups was performed. (See figure 5). No significant difference (t = 1.40, 67 d.f.) was found between the mean gain scores of the groups.

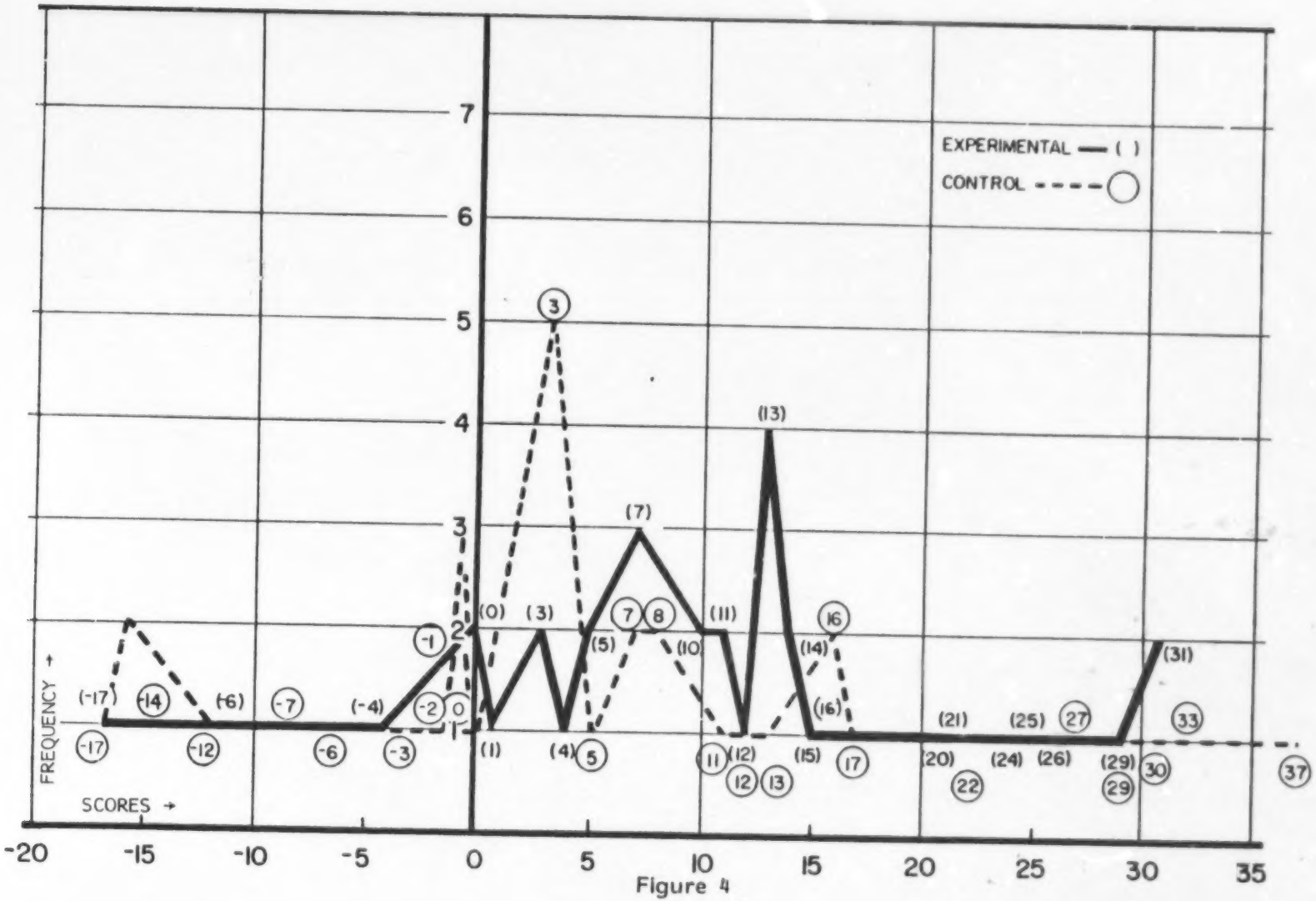
Conclusions

An analysis of the data from this study indicated that programed tutoring did not significantly increase the reading comprehension of Chapter 1 eligible fourth-grade students. The fact that the experimental and control groups were not equivalent at the onset was an initial problem for the study. Since the experimental group's mean scores were significantly lower on the pretest, regression toward the mean cannot be ruled out when examining the gains made by this group.

A trend evidenced by the study, i.e. fewer students who were tutored showing a loss between the pretest and posttest as compared to the untutored

Figure 4

Frequency Distribution of Subjects' NCE's Gain Scores


EXPERIMENTAL — ( )
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FREQUENCY →
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Figure 4

Figure 5

Comparison Data for Mean Gain NCE's Scores
for Both Groups

	Mean	Standard Deviation	Standard Error	Median	Skew-ness	Kurtosis
Experimental	11.057	10.724	1.813	11.250	-0.112	0.334
Control	6.912	13.756	2.359	3.500	0.435	-0.269

students, is supported by past statistics compiled by the Tippecanoe School Corporation. Another trend noted was that students who were not tutored tended to exhibit more variability in their posttest as compared to a lack of variability in their pretest scores. Programed tutoring seems to keep nearly all tutored students moving toward improvement in their reading comprehension scores.

Ellson, et al. (1977b) found programed tutoring to be most effective with students in the primary grades and students who were experiencing difficulty with reading. Wang, et al. (1981) reported that Title 1 programs had a postitive impact on reading achievement in the first three grades only. Therefore, the results of this study gave additional support to the previous findings.

The National Assessment of Educational Progress (1981) spoke of students in Title 1 programs narrowing the gap in reading achievement. The experimental group in this study did narrow the gap between themselves and the control group which began the study with significantly higher scores. However, the gains made in narrowing the gap were not great enough to provide evidence that programed tutoring had a statistically significant effect on reading comprehension.

Campbell (1969) elaborated on the problem of evaluating the effectiveness of programs established by the Great Society legislation in his article on "Reforms as Experiments." He stated "that specific reforms are advocated as though they were certain to be successful" (p. 409). Because Chapter 1 is "believed to be successful," school districts are discouraged from withholding remediation from eligible students by random assignment of students to control and experimental groups. This study

would have been strengthened if students in the first four grades could have been randomly assigned to experimental and control groups. A semester long experimental study would have been another preferable alternative to the study that was undertaken. This would have allowed all students to receive at least one semester of tutoring.

The data in this study do not present compelling evidence for the use of programed tutoring with fourth-grade, Chapter 1 eligible students. Trends detected within the constraints of this study seemed to indicate that programed tutoring has a beneficial, though not significant, effect on reading comprehension.

Recommendations

Further research should be undertaken to determine if remedial instruction delivered by a machine; specifically a microcomputer, is more effective at the fourth-grade level for Chapter 1 eligible students. In view of the fact that many school districts are purchasing microcomputers with Chapter 1 monies, it seems appropriate to evaluate this method of instruction also.

Campbell (1969) has suggested that where randomization is not feasible or morally justifiable, the regression discontinuity design should be used. No Chapter 1 or Title 1 program evaluations included in articles or reviews of research used this design. This design should be used in post hoc research on Chapter 1 programs where local criteria specifies a definite decision point about which students will be served.

A pressing need in the area of research on effective methods to use in Chapter 1 programs is for longitudinal studies. This type of research would be most appropriate in a school district where the same Chapter 1

eligibility criteria and instructional method have been used for several years.

One can only wonder how long Congress will see fit to fund Chapter 1 programs if research studies do not provide statistically and educationally significant results.

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Appendix A
Reading Comprehension NCE's--Experimental Group

Subject	Pretest	Posttest	Gain or Loss
1	42	25	-17
2	31	25	-6
3	25	21	-4
4	7	7	0
5	25	25	0
6	35	36	+1
7	35	38	3
8	31	34	3
9	21	25	4
10	35	40	5
11	35	40	5
12	38	45	7
13	38	45	7
14	33	40	7
15	38	48	10
16	31	41	10
17	37	48	11
18	37	48	11
19	42	54	12
20	21	34	13
21	18	31	13
22	15	28	13
23	35	48	13
24	31	45	14
25	7	21	14
26	31	46	15
27	15	31	16
28	5	25	20
29	15	36	21
30	35	59	24
31	25	50	25
32	15	41	26
33	35	64	29
34	15	46	31
35	15	46	31

Lowest score - 5 Lowest score - 7
Highest score - 42 Highest score - 64

Appendix B
Reading Comprehension NCE's--Control Group

Subject	Pretest	Posttest	Gain or Loss
1	38	21	-17
2	33	19	-14
3	42	28	-14
4	31	19	-12
5	38	31	-7
6	42	36	-6
7	37	34	-3
8	42	40	-2
9	39	38	-1
10	37	36	-1
11	42	41	-1
12	31	31	0
13	37	40	+3
14	37	40	3
15	37	40	3
16	37	40	3
17	35	38	3
18	40	45	5
19	33	40	7
20	33	40	7
21	40	48	8
22	37	45	8
23	25	36	11
24	42	54	12
25	25	36	11
26	42	58	16
27	42	58	16
28	27	44	17
29	42	64	22
30	25	52	27
31	33	62	29
32	31	61	30
33	29	62	33
34	31	68	37
	Lowest score - 25 Highest score - 42	Lowest score - 19 Highest score - 68	